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Standard Specification for
WIRE-CLOTH SIEVES FOR TESTING PURPOSES[1]

This Standard is issued under the fixed designation E 11; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

$^{\epsilon}$ NOTE 1—Note 1 was editorially deleted in October 1970 and all subsequent notes renumbered accordingly.
NOTE 2—Table 1 was editorially changed in August 1973.

1. Scope

1.1 This specification covers sieves wherein a screening medium of woven-wire cloth is mounted in a frame for use in precision testing in the classification of materials according to particle size (Notes 1 to 4). Methods of checking and calibrating sieves are included as information in the Appendix.

NOTE 1—Some industries may possibly require more restrictive specifications for sieves for special testing purposes. Where such high precision is required, "Matched Sieves"[2] have proven useful. "Matched Sieves" are selected for comparability to a set of "Master Sieves" by a sieving test of the particular material used by an industry.

NOTE 2—Complete instructions and procedures on the use of test sieves are contained in *ASTM STP 447*, *Manual on Test Sieving Methods*. This manual also contains a list of all ASTM published standards on sieve analysis procedures for specific materials or industries.

NOTE 3—Attention is called to ASTM Method C 430, Test for Fineness of Hydraulic Cement by the No. 325 (45-μm) Sieve,[3] which contains requirements for 2-in. (50-mm) diameter sieves used in the mineral industry, especially the cement group.

NOTE 4—For other types of sieves see ASTM Specification E 323, for Perforated-Plate Sieves for Testing Purposes,[4] and ASTM Specification E 161, for Precision Electroformed Sieves.[4]

2. Wire-Cloth Sieves

2.1 The openings of the wire cloth of successive standard sieves progress from a base of 1 mm in the ratio of approximately $\sqrt[4]{2/1}$. In selecting sieves from this series it is customary to take each sieve in a given range, every second sieve, or every fourth sieve.

2.2 Wire cloth for standard sieves shall be woven from brass, bronze, or other suitable wire with a plain weave, except that cloth with openings of 63 μm (No. 230) and finer may be woven with a twill weave. The wire shall not be coated or plated.

2.3 Wire cloth shall conform to the dimensional requirements of Table 1. The average opening (distance between parallel wires), both in the warp and shoot directions, measured separately, shall conform to the value in column 1, within the permissible variation in average opening given in column 4. The maximum individual opening shall not exceed the value given in column 6. Not more than 5 percent of the openings shall exceed the value given in column 5. The average diameter of the warp and of the shoot wires, taken separately, of the cloth of any sieve shall be that given in column 7, within the permissible range given in Footnote *a*. All measurements of openings and wire diameters shall be made on the wire cloth mounted in the completed sieve.

2.4 Both the warp and shoot wires shall be crimped in such a manner that they will be rigid when in use.

2.5 There shall be no punctures or other obvious defects in the cloth.

3. Frames

3.1 *General Requirements*—Frames for wire cloth sieves shall be constructed of noncorrosive material such as brass or stainless steel in such a manner as to be permanently rigid. Pans and covers shall be so made as to nest with the sieves. The wire cloth shall be mounted on the frame without distortion, looseness, or waviness. To prevent the material being sieved from catching in the joint between the wire cloth and the frame, the joint shall be smoothly filled with solder or so made that the material will not be trapped.

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[1] This specification is under the jurisdiction of ASTM Committee E-29 on Particle Size Measurement and is the direct responsibility of Subcommittee E29.01 on Sieves.

Current edition effective May 29, 1970. Originally issued 1925. Replaces E 11 – 61.

[2] Available from W. S. Tyler, Inc., Mentor, Ohio 44060.

[3] *1974 Annual Book of ASTM Standards*, Part 13.

[4] *1974 Annual Book of ASTM Standards*, Part 41.

3.2 *Standard Frames*—The standard sieve frame shall be circular, 8.0 in. (203.2 mm) in diameter, of seamless construction. The permissible variation on the mean inside diameter 0.2 in. (5.08 mm) below the top of the frame shall be +0.03 in. (0.762 mm). The bottom of the frame or "sieve skirt" shall be so constructed as to have an easy sliding fit in any sieve conforming to the above permissible variation, and in no case shall this outside diameter be less than 7.970 in. (202.438 mm) nor more than 8.000 in. (203.20 mm). The height of the sieve from the top of the frame to the wire-cloth surface shall be either 2 in. (50.8 mm), designated as full-height, or 1 in. (25.4 mm), designated as half-height. The joint or fillet shall be so constructed as to allow a minimum clear sieving surface 7.5 in. (190.5 mm) in diameter.

3.3 *Nonstandard Frames*—Frames of sieves having nominal openings of less than 25 mm but greater than 4.00 mm may be either of the standard size or of larger dimensions as may be specified in individual cases. Frames of sieves having nominal openings of 25 mm or more should be larger than the standard size. The use of special size and shape frames for special purposes is not precluded. For some purposes, sieve frames larger than the standard size may be either square, rectangular, or circular, and for nominal openings 25 mm and coarser may be made of metal or hardwood. The use of special size and shape frames, however, should be discouraged where the standard frames could be used, because the results are not necessarily comparable.

3.4 *Three-Inch Sieves*—Frames 3 in. (76.2 mm) in inside diameter should not be used for sieves with openings larger than 150 μm (No. 100). The tolerances on the diameter of the sieve frames shall be the same as for the standard size covered in 3.2. The depth of the sieve from the top of the frame to the cloth shall normally be 1.25 in. (31.75 mm), but not less than 0.75 in. (19.05 mm).

4. Label Marking

4.1 Each sieve shall bear a label marked with the following information:

4.1.1 U.S.A. Standard Sieve,

4.1.2 ASTM designation E 11,

4.1.3 Standard sieve designation (from Table 1, Column 1),

4.1.4 Name of manufacturer on distributor, and

4.1.5 Alternative sieve designation (From Table 1, Column 2) Optional.

TABLE 1 Nominal Dimensions, Permissible Variations for Wire Cloth of Standard Test Sieves (U.S.A. Standard Series)

Sieve Designation		Nominal Sieve Opening, in.[c]	Permissible Variation of Average Opening from the Standard Sieve Designation	Maximum Opening Size for Not More than 5 percent of Openings	Maximum Individual Opening	Nominal Wire Diameter, mm[a]
Standard[b]	Alternative					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
125 mm	5 in.	5	±3.7 mm	130.0 mm	130.9 mm	8.0
106 mm	4.24 in.	4.24	±3.2 mm	110.2 mm	111.1 mm	6.40
100 mm[d]	4 in.[d]	4	±3.0 mm	104.0 mm	104.8 mm	6.30
90 mm	3 1/2 in.	3.5	±2.7 mm	93.6 mm	94.4 mm	6.08
75 mm	3 in.	3	±2.2 mm	78.1 mm	78.7 mm	5.80
63 mm	2 1/2 in.	2.5	±1.9 mm	65.6 mm	66.2 mm	5.50
53 mm	2.12 in.	2.12	±1.6 mm	55.2 mm	55.7 mm	5.15
50 mm[d]	2 in.[d]	2	±1.5 mm	52.1 mm	52.6 mm	5.05
45 mm	1 3/4 in.	1.75	±1.4 mm	46.9 mm	47.4 mm	4.85
†38.1 mm	1 1/2 in.	1.5	±1.1 mm	39.1 mm	39.5 mm	4.59
31.5 mm	1 1/4 in.	1.25	±1.0 mm	32.9 mm	33.2 mm	4.23
26.5 mm	1.06 in.	1.06	±0.8 mm	27.7 mm	28.0 mm	3.90
25.0 mm[d]	1 in.[d]	1	±0.8 mm	26.1 mm	26.4 mm	3.80
22.4 mm	7/8 in.	0.875	±0.7 mm	23.4 mm	23.7 mm	3.50
19.0 mm	3/4 in.	0.750	±0.6 mm	19.9 mm	20.1 mm	3.30
16.0 mm	5/8 in.	0.625	±0.5 mm	16.7 mm	17.0 mm	3.00
13.2 mm	0.530 in.	0.530	±0.41 mm	13.83 mm	14.05 mm	2.75
12.5 mm[d]	1/2 in.[d]	0.500	±0.39 mm	13.10 mm	13.31 mm	2.67
11.2 mm	7/16 in.	0.438	±0.35 mm	11.75 mm	11.94 mm	2.45
9.5 mm	3/8 in.	0.375	±0.30 mm	9.97 mm	10.16 mm	2.27
8.0 mm	5/16 in.	0.312	±0.25 mm	8.41 mm	8.58 mm	2.07
6.7 mm	0.265 in.	0.265	±0.21 mm	7.05 mm	7.20 mm	1.87
6.3 mm[d]	1/4 in.[a]	0.250	±0.20 mm	6.64 mm	6.78 mm	1.82
5.6 mm	No. 3 1/2[e]	0.223	±0.18 mm	5.90 mm	6.04 mm	1.68
4.75 mm	No. 4	0.187	±0.15 mm	5.02 mm	5.14 mm	1.54
4.00 mm	No. 5	0.157	±0.13 mm	4.23 mm	4.35 mm	1.37
3.35 mm	No. 6	0.132	±0.11 mm	3.55 mm	3.66 mm	1.23
2.80 mm	No. 7	0.111	±0.095 mm	2.975 mm	3.070 mm	1.10
2.36 mm	No. 8	0.0937	±0.080 mm	2.515 mm	2.600 mm	1.00
2.00 mm	No. 10	0.0787	±0.070 mm	2.135 mm	2.215 mm	0.900
1.70 mm	No. 12[e]	0.0661	±0.060 mm	1.820 mm	1.890 mm	0.810
1.40 mm	No. 14	0.0555	±0.050 mm	1.505 mm	1.565 mm	0.725
1.18 mm	No. 16	0.0469	±0.045 mm	1.270 mm	1.330 mm	0.650
1.00 mm	No. 18	0.0394	±0.040 mm	1.080 mm	1.135 mm	0.580
850 µm[f]	No. 20	0.0331	±35 µm	925 µm	970 µm	0.510
710 µm	No. 25	0.0278	±30 µm	775 µm	815 µm	0.450
600 µm	No. 30	0.0234	±25 µm	660 µm	695 µm	0.390
500 µm	No. 35	0.0197	±20 µm	550 µm	585 µm	0.340
425 µm	No. 40	0.0165	±19 µm	471 µm	502 µm	0.290
355 µm	No. 45	0.0139	±16 µm	396 µm	425 µm	0.247
300 µm	No. 50	0.0117	±14 µm	337 µm	363 µm	0.215
250 µm	No. 60	0.0098	±12 µm	283 µm	306 µm	0.180
212 µm	No. 70	0.0083	±10 µm	242 µm	263 µm	0.152
180 µm	No. 80	0.0070	±9 µm	207 µm	227 µm	0.131
150 µm	No. 100	0.0059	±8 µm	174 µm	192 µm	0.110
125 µm	No. 120	0.0049	±7 µm	147 µm	163 µm	0.091
106 µm	No. 140	0.0041	±6 µm	126 µm	141 µm	0.076
90 µm	No. 170	0.0035	±5 µm	108 µm	122 µm	0.064
75 µm	No. 200	0.0029	±5 µm	91 µm	103 µm	0.053
63 µm	No. 230	0.0025	±4 µm	77 µm	89 µm	0.044
53 µm	No. 270	0.0021	±4 µm	66 µm	76 µm	0.037
45 µm	No. 325	0.0017	±3 µm	57 µm	66 µm	0.030
38 µm	No. 400	0.0015	±3 µm	48 µm	57 µm	0.025

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[a] The average diameter of the warp and of the shoot wires, taken separately, of the cloth of any sieve shall not deviate from the nominal values by more than the following:

Sieves coarser than 600 µm	5 percent
Sieves 600 to 125 µm	7 1/2 percent
Sieves finer than 125 µm	10 percent

† Editorially changed, August 1973.

TABLE 1 *Concluded*

[b] These standard designations correspond to the values for test sieve apertures recommended by the International Standards Organization, Geneva, Switzerland.

[c] Only approximately equivalent to the metric values in Column 1.

[d] These sieves are not in the standard series but they have been included because they are in common usage.

[e] These numbers (3 1/2 to 400) are the approximate number of openings per linear inch but it is preferred that the sieve be identified by the standard designation in millimeters or µm.

[f] 1000 µm = 1 mm.

APPENDIX

A1. METHODS OF CHECKING WIRE-CLOTH SIEVES TO DETERMINE WHETHER OR NOT THEY CONFORM TO SPECIFICATION

A1.1 Except for the very coarse sieves, the most reliable method of determining the average opening is to calculate it from the value obtained for the average diameter of the wires and the number of wires per unit of length. The value for the average diameter of the wires is obtained by measuring 5 to 10 wires that are evenly spaced across the sieve. The number of measurements depends upon the uniformity of the wire and the closeness of the measurements to the limits permitted. All measurements must be made in both the warp and shoot directions and considered separately.

A1.1.1 *Sieves 125 to 11.2-mm*—Measure 1 to 5 openings and wires with a vernier caliper or flat "go", "no-go" gages.

A1.1.2 *Sieves 13.2 to 3.35-mm*—Determine the mesh by measuring the distance occupied by at least 10 openings and 10 wires and measure the diameter of at least 5 wires. Use a measuring microscope (linear comparator) with an 80-mm objective lens in the microscope.

NOTE A1—These microscopes should have a tube length of about 160 mm and a 10 × eyepiece.

A1.1.3 *Sieves 4.0 to 2.0-mm*—Determine the average opening and wire diameter in the same manner as in A1.1.2 except that a 67-mm objective lens is used in the microscope. (Note A1).

A1.1.4 *Sieves 2.8 to 1.0-mm*—Same as in A1.1.2 except that a 60-mm objective lens is used in the microscope (Note A1).

A1.1.5 *Sieves 850 to 425-µm*—Determine the mesh by means of the "Moire effect" and measure the diameter of at least 5 wires with a microscope (Note A1) fitted with a split-image eyepiece and a 48-mm objective lens.

A1.1.6 *Sieves 425 to 106-µm*—Same as in A1.1.5 except that the microscope (Note A1) should be fitted with a 32-mm objective lens.

A1.1.7 *Sieves 125 to 38-µm*—Same as in A1.1.5 except that the microscope (Note A1) should be fitted with a 16-mm objective lens.

A1.1.8 Determine the maximum openings and the number of openings larger than the intermediate permissible variation in both the warp and shoot directions. Make measurements with the same devices used to measure wire diameters. Use a mechanism to hold the sieve and slowly move it under the microscope for a distance of at least 150 mm. Scan the openings along a diameter of the sieve and measure excessively large openings. If the openings are larger than the intermediate permissible variation they should be counted and the percentage calculated.

A1.1.9 Measurements needed in A1.1.5 through A1.1.8 can also be made with projection equipment having suitable magnification.

A1.2 With round "go", "no-go" gages check the dimension of the frames.

A1.3 Determine the magnification of optical devices with calibrated stage micrometers.

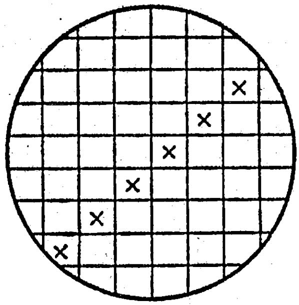
A1.4 Determine the mesh count by means of the "Moire effect," also known as "picket-fence interference," with accurately graduated glass scales.[2] For the 75-µm sieve, for instance, a glass scale with approximately 200 lines to the inch is used. The opaque lines are about equal in width to the space between the lines and must be uniformly spaced. When a scale such as this is laid on woven-wire cloth having a mesh per unit length approximating the number of lines per unit length on the scale, and a strong light is placed beneath, dark bands will appear which in a unit length are equal in number to the difference between the mesh of the cloth and the graduation of the scale. If the scale is moved lengthwise, in a direction perpendicular to the lines, the dark bands will also move. If these bands move in the same direction as the motion of the scale, the mesh of the sieve is less; if the motion is in the opposite direction, the mesh is greater than the number of lines on the scale. If some bands move in one direction and some in the other, the number moving in each direction must be counted separately, and the algebraic sum taken as the number of bands. For sieves 850-µm (No. 20) to 212-µm (No. 70) inclusive, the best results are obtained with a transparent line about the width of a wire diameter ruled on an opaque background. For sieves coarser than these it is usually necessary to count the wires by the aid of a hand lens, using a steel scale as the standard. Scales should be calibrated before being used in testing sieves.

A1.5 The National Bureau of Standards accepts wire-cloth sieves 5.6-mm and finer for test to determine conformity to specifications.

A2. METHODS OF CALIBRATING WIRE-CLOTH SIEVES

A2.1 A wire-cloth sieve may be calibrated by plotting the frequency of occurrence of the size of the openings as indicated in the following procedure: Six fields are chosen in such a manner that none of the openings to be measured will have common wires. In each field the openings to be measured should lie in a diagonal direction across the sieve (see Fig. A1). The openings in three of the fields should lie in a direction at right angles to those in the other three fields. Measure at least 50 openings in each field. Measure each opening between the warp wires and the shoot wires and separately tabulate and plot the readings.

A2.2 For routine checking of sieves and for determining the effective sieve opening a method employing glass spheres is recommended. These glass spheres should not be used to determine conformity to specifications. Glass spheres for sieve calibration may be obtained from the Supply Division, National Bureau of Standards, Washington, D.C. 20234. Four of these standard reference materials are now available: SRM 1019a for calibrating sieves No. 8 to 35; SRM 1018a for calibrating sieves No. 20 to 70; SRM 1017a for calibrating sieves No. 50 to 170; and SRM 1004 for calibrating sieves No. 140 to 400. Detailed instructions for the use of the glass spheres for calibrating sieves are furnished with each sample.



NOTE—Only the indicated openings are measured.

FIG. A1 Method of Selecting Openings for Plotting of Different Sizes of Openings.

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